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Operation of Medicines
on the
Animal System.

Tingnal Jones

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An Essay
on the
Operation of Medicines
on the
Animal System,
and
Several Physiological Points
with which
It is Connected.

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Preface.

Being fully impressed with a belief that the only bene-
-fits which result to the science of medicine from the
dissertations of graduates in the different schools of me
-dicine, arise from those, in which are communicated some
new facts or principles, or an attempt to investigate some of
the most obscure and difficult parts of that science, and
not from an implicit sanction, or a compilation of the pre
-vailing doctrines and improvements of different authors,
I have carefully avoided the latter, and obeyed the dic
-tates of duty by endeavouring to explore a new some of
its most rugged and unknown parts; to this resolution
I was not urged by any flattering prospects of succes,
but from an obligation which I think is enjoined on every
candidate by that regulation of universities which requires
of them an essay. Although I am conscious that my ef
-forts will not lead me to a complete elucidation of

the subject which I have chosen, yet I shall feel myself very amply rewarded if I point out an error of other adventurers, and only invite the attention of, and furnish one material for those whose talents and resources may enable them to burst asunder some obstacles, and dispel the dark clouds which hang over some parts of our science.

The object of this essay is to advance a few ideas on the operation of medicines on the animal system, and also the several points of physiology which it necessarily involves, not founded on any experiments and observations of my own, but suggested to me only in the course of my studies on some of the functions of the animal economy, and by a knowledge of the properties and effects of a few classes of medicines, made known to me by different authors on the materia medica. This I acknowledge is a vague and incorrect method of attaining

a truth in philosophical inquiries, yet from a few established principles assisted by reason and analogy, we may sometimes form theories which may point out a new course to future adventurers, and give rise to experi-ments, which may bring into view the causes of phenome-na that otherwise would lie dormant for centuries. These are the views by which I have been prompted to form many visionary conjectures concerning the physi-ological points which have an immediate bearing to the principal subject. Though as many of the opera-tions in nature, are so obscure as to admit of no experi-ments for their elucidation, we are compeled to frame our theories to meet the actual facts with which we are acquainted; and as originality has been my design in this I have given no restraint to my imagination on these subjects.

If my opinions in this essay should dissent from

doctrines taught in this institution, let me candidly avow that it arises not from a want of veneration and due respect towards their authors, but from that inde-pendence and freedom which has characterized all their opinions, and which I doubt not their libera-lity will grant me and every other tyro in me-dicine.

It is necessary before I enter on the subject which is the principal design of this essay to make some preliminary observations on several physiological points which have so intimate and immediate a connection with the subject before me, that to dispense with them entirely, would be as impracticable, as attempting to erect a fabric without first giving to it a strong foundation.

As the primary agent, and proximate cause of perfect animal life consists in the motion of the fluids and some of the solids of the system, and as the administration of medicine has for its object either some modification, diminution, or increase of this principle; the first thing which naturally presents itself for investigation, is that organ or organs belonging to the animal system in which, is vested the power of exciting to action the muscular fibres, and also receiving sensible impressions from different substances taken into the system; for

the muscles are the parts which perhaps are alone sus-
-ceptible of that contractile action or motion giving the
principal characteristic to animal existence.

Whether the muscular fibre possesses within itself an in-
-herent power of contracting from the application of a
stimulus, or whether this contraction is produced in them by the
operation of stimuli through the medium of the nerves,
are the two points at issue; the former however which
is the theory tacitly defended by Mr. John Bell is gene-
-rally received as reasonable and correct: that is, that there
exists in the muscles an inherent principle, called by
him vis insita, which is an original endowment, indepen-
-dent of the nerves and is the source of motion and
animal life. However plausible this theory may ap-
-pear, from the first view, yet we should not implicitly
adopt it, if from a minute examination we discover
it in the smallest degree exceptionable and if another
in the mean time suggests itself of a more extensive

application, and a more concordant nature.

That there is a nervous influence originating in the brain and propagated throughout the nervous system, which is the primum mobile or primary cause of all action in the system, and that this may be varied by the operation of different substances received into the system, is the theory which I shall endeavour to establish, to do which, I shall be compelled to take into consideration all the principal subjects which belong to the propositions that I shall advance. As nervous influence appears to be the primary agent in the production of motion, it will not I think be a digression to take a cursory view of its propagation concerning which there has been such a vast variety of conjecture; though the one which most generally prevails, is, that of D. Monroe; on which I shall make a few comments, and infer from some primary objections therein the rationality of the one which I shall adopt. The following are the

outlines of his theory: viz. "That there is a very subtile fluid secreted in the brain moving in a constant, equal, slow stream from the brain and spinal marrow into each of the proper nervous fibres and that an impres-sion made by the objects of the senses on the very soft pulpy extremities of the nerves of the organs of the senses must make such a stop to the equal flowing ner-vous fluid, as must instantaneously be perceptible at the origin from which the fibres affected arise; and that the constant flow of the nervous fluid into the cavity of the nervous fibrillae occasion the natural contraction of the muscles by incresing the transverse and shortening the longitudinal diameter of each fibre; and in producing voluntary motion the will has a power of determining a greater quantity of this fluid and with greater velocity into what mus-cle it pleases." Now in this there appear to me seve-ral objectionable points which do not accord with

philosophical principles; for in the first place that the slightest and most delicate impressions made on the extre-mities of a nerve capable of exciting sensation, should produce an agitation in the columns of nervous fluid, which would be propagated through that extensive mass of slug-gish and inactive matter of the nerves and substance, inveloping them, appears quite contrary to the Laws of hydraulics, for the communication of an impulse made on one extremity of a column of fluid is extensive and rapid always in proportion to the elasticity or firmness of the tube contain-ing it, and the degree of force in the impulse given; therefore it is presumable that mechanical motion cannot be propagated from the termination of a nerve in the extremities of the body to the brain by so slight an impression made on an organ so little calculated to communicate motion. 2ly. If the nervous tubes be dilatable (which we would infer from the opinion of Dr Monroe that

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a greater quantity of this nervous fluid can by the acti-
-on of the will be propeled through the nerves at some
than other times.) even admiting the gineration of this
nervous fluid in the brain, and its constantly flowing
through the nerves to their extremities, we would rationally
be led to conclude that by giving an impediment
to the passage of the nervous fluid in the extremity of
a nerve, the area of the tube containing it, would be
some incread near the place of compression than
counteract the gravity and force of the whole column of
fluid. To illustrate this, let us suppose an artery of
great length nearly filled with blood, and its position
perpendicularly downwards; could we reasonably suppos
that a very slight impresion made on its lower extre
-mity would propagate motion through the column of blood
to the heart in opposition to the force of the blood
and its gravity? I promptly answer in the nega
-tive

and as the nerves if they did have tubes and a fluid therein, would be much less calculated for the propa-gation of motion than the arteries, we may readily dis-cover the impropriety of thus accounting for the propa-gation of nervous influence, and sensation necessarily dependent thereon. 3ly. And Lastly, in the numerous experiments made on the subject there never has been detected a tube in the nerves nor a fluid therein.

After using these few insurmountable objections to a the-ory which I at first felt inclined to adopt, I have thought much on the subject, and a mature consideration of the facts which prove the existence of a nervous influence in every part of the system, even the most remote from the brain; the rapidity with which it is conveyed & put into action by the will; and the momentary production of sensation by an impression on any of the sentient parts of the system, has irresistably led me to the

conclusion, that in forming an hypothesis embracing all the facts and obviating all the difficulties belonging to the subject, we must reject the idea of any thing like an aqueous fluid and have recourse to one approach-ing in subtility, rapidity of motion &c. to electricity or galvanism. From all the numerous researches of man into the abstruse and intricate works of nature, it ap-pears there is a veil beyond which the human un-derstanding is incapable of penetrating, and when having arrived at it, hypothesis and analogy are the only pilots to which we can resort, and theories must then be made to bend and meet actual facts. In my spe-culations therefore, may I not ask, is it irrational to suppose that an electric or galvanic fluid is gene-rated or accumulated in the brain, pervades the ner-vous system and is completely subject to the will, and that an impression made on the extremity produ-

-ces

sensation by calling into action and thereby abstracting a part of this fluid from the brain? Sensation therefore agreeably to this hypothesis is excited by a loss of this peculiar fluid in the brain instead of its being propeled thereto in greater quantity, and consequently, the greater the imitation or impression on the nerves the more distinct is the sensation produced. In the animal kingdom have we not facts nearly corresponding with this conjecture? The fact indeed is well established that in several kinds of fish, the torpedo, gymnotus electricus, and sylurus electricus, for instance, have the power of generating a fluid very similar to galvanism which is completely subservient to the will, and that it is propeled from its source with a rapidity and violence proportioned to the imitation given by surrounding objects; therefore may not the human species and other animals, (in different degrees) possess a power of generating or accumulating a similar fluid

which is equally subservient to the will and the production of sensation. It is certainly very manifest that galvanism artificially produced and applied to the principal nerve of a limb exerts an action on the muscular fibres to which it is distributed, similar to that produced by the operation of the will, differing only in degree of violence and regularity. This singular fact, very much corroborates and favours the idea, that the will has a fluid for its agent similar to the galvanic. To extend our views still farther on this intricate subject, let us suppose the will to exist not alone in the brain, but that, that faculty or intelligent principle pervades also the medulla spinalis and that part of the nervous system over which its influence extends though its principal habitation be in the brain. When we discover that its operation or influence is not confined to the brain, but likewise extends to the spinal

marrow

and also to the nerves of the voluntary muscles; and again that the substance of the brain and nerves is perfectly homogeneous, being a continuation of the same thing and have a mutual dependance on each other, the supposition is not futile but on the contrary, carries with it some degree of probability: for the rudiment of the mind is solely dependent on the condition of the external senses for the formation of its faculties, and on the other hand the state of the external senses equally dependant on the healthy condition and energy of the brain. Therefore, let us suppose either the will to be seated in the brain and has for its agent in the production of muscular motion something like the galvanic fluid; or that it it is not confined alone to the brain but extends also to the nerves of the voluntary muscles, ready to put into action the fluid with which the nerves may

be supplied, thereby producing the instantaneous con-
traction of any muscle subject to its control. The
nerves over which the will has no command, being
small, more insulated, and passing through muscles,
such as the heart, arteries, &c. whose fibres are more
dense, and compact than the voluntary ones we may
suppose they afford no residence for the will and con-
sequently they are involuntary in their action. But
after all this train of hypothesis concerning the propa-
gation of nervous influence it still remains to us in-
volved in mystery and darkness; though it is suffi-
cient for us to know, that motion excited in any part of
the system, is absolutely dependent on the presence of
nerves, as it is through their medium alone that mus-
cular action is produced; in what manner they effect
this contraction in the muscular fibre by the applica-
tion of a stimulus to them I shall not pretend to

account

being perhaps behind the veil placed between the se
-crets of nature and human investigation.

This leads us to resume the consideration of Mr. Bell's de
-fence of the opinion, that the irritable principle call
-ed by him the vis insita is a distinct and inherent
property of the muscular fibre perfectly independent
of the nervous system. That the muscular fibre is sus
-ceptible of contraction is very evident, but that it pos
-sesses an intelligent principle within itself, which
produces contraction from the application of stimuli
appears to me very doubtful. 1st. Because in the liv
-ing system the vis insita exists in no part without
the presence of nerves, and it increases or diminishes in
proportion as the excitement of the nervous system is
greater or less, (under certain limits) for when under
the operation of a stimulus the system is both more
irritable, and sensible, than when the energy of the
brain

and nerves is much impaired, as is the case in palsy &c.
2ly. In a muscle paralysed by the division of its prin-
-ciple nerve, we very evidently see that its sensibility
is not only much destroyed, but its irritability is also
considerably diminished, and the arterial action ex-
-ceedingly feeble, which is a correct criterion by which
we may judge of the state of irritability or vis insita of
W.m Bell, as this action is induced by the application
of the blood to this irritable principle, and consequently
it should always be in proportion to the degree of irrita-
-bility and the force of stimulus applied. Now if this
irritable property were an inherent and original endow-
-ment of the muscular fibre perfectly independent of
the nerves, in what rational manner could it possibly
account for its diminution, while in other parts of the
system which receive their usual portion of nervous in-
-fluence, a natural and ordinary action of the arteries

is

kept up? I see no other than by placing the irritable principle among the properties of nerves. The strongest post by which Mr. Bell defends his position is, the power which a muscle possesses of being excited to contract by the application of an irritant for a short time after its separation from the system, which I think is by no means impregnable; for I can just as readily conceive that nervous influence can exist in a part for a short time after its separation from the brain, as that any property of a muscle should remain any length of time after being separated from the general system on which it depends for life. And as to the existence of irritability in the vegetable kingdom we cannot absolutely prove it to be independant of nervous influence of a grade inferior to that of the animal creation, for in some parts of the animal system we have instances of the existence of sensibility, as it were in

in a latent or dormant state, where nerves can be readily detected, of which the bons tendons &c are examples when in a diseased state; and again some of the inferior orders of the animal kingdom which possess little or no brain have this irritable principle (or low grade of sensibility as I shall call it) in a great degree, and yet at the same time they are nearly destitute of common sensibility, which I would ascribe to the great quantity of nerves and very small quantity of brain. Therefore we may receive this for a maxim, that in the animal kingdom sensibility is in proportion to the quantity of brain and irritability in proportion to the quantity of nerve without brain. These few capital objections to the theory advocated by Mr. Bell (to which no doubt others might be added) urge me strongly to the belief that what is termed vis insita is nothing more than a modification of sensibility existing in the nerves of each mus-

-cle

modified agreeably to the density and texture of their fi-
bres and quantity of nerves with which they are supplied:
for instance, we see the arterial system, the alimentary
canal, the lymphatics, &c. whose actions are evidently
muscular, each possess an irritability or vis insita pe-
culiar to itself, being adapted to certain stimuli as
the blood, aliment, chyle &c. in producing ordinary and
healthy action. Now if this excitability belonged exclu-
sively to the organization of the muscular fibre, in
what rational manner could we account for its various
modifications in different parts of the system, since
it is ascertained ~~in proof~~ as far as observation has gone
that every muscular fibrilla is identically the same
notwithstanding their difference in colour and ar-
rangement. To solve this and other difficulties we
are compelled to bring in the agency of nervous in-
fluence; for if this peculiar property of irritability

were

dependent on the component principles and certain formation of the minutest muscular fibres themselves, the mere circumstance of arrangement would not have the smallest influence in giving different degrees & modifications of their property. It is my belief that the most plausible and unexceptionable method of surmounting the obstacles with which we must in Mr. Bell's theory, is, to consider what has been termed irritability of muscles a property belonging to the nervous system, for in them we discover an extensive resource, by which the phenomena above alluded to may be satisfactorily explained: Thus notwithstanding the homogeneous nature of the nerves in every part of the system it is very manifest that they are susceptible of receiving very different degrees of sensibility, varied by certain circumstances, which I am inclined to believe in the different degrees of laxity & density of the parts through which they

pass; rendered more sensible in proportion to the slightness of pressure on the nerves by the cellular membrane or muscular fibre which envelops them; or their extensive exposition to the peculiar stimuli to which they are adapted: for example: the different senses as those of vision, hearing, smell, taste, and touch, are all modifications of sensibility belonging exclusively to the nerves; the sense of vision which I conceive to be the most acute of all the senses, being excited by the most subtile of all substances in nature is seated in a nervous pulp, not surrounded or compressed by any matter through which light is incapable of penetrating, and consequently a greater quantity of nervous matter comes in contact with this stimulus, and thereby the sensation excited is rendered more perfect. Again the nerves in which is seated the sense of hearing, are perhaps next in point of sensibility, as approaching nearer the circumstances which I have premised to favour sensibility; and so on with the

rest

of the senses, in proportion to their approach to these cir
-cumstances; for it would be quite absurd to suppose that
different nerves originating from the same source the brain,
and identically the same in substance, should be endow
-ed each with a peculiar and distinct sensibility, independent
of collateral circumstances. Seeing then that the texture of
the parts through which nerves pass, and their greater or
less exposition to the action of stimuli greatly influence
their degree of sensibility we may rationally account for the
peculiar sensibility or irritability of the different parts
of the system as the heart, arteries, stomach, lymphatics &c.
on the same principle, if we admit that the property which
has been termed irritability or vis insita is only an inferior
degree of sensibility and consequently a property of the nerves.
From this I conclude that the action of the involuntary mus
-cles is dependent on nervous influence, and their action is
greater or less in proportion to the force of stimulus applied

and

the state of the nerves in the different parts: viz. that the different degrees of compression and envelopment of the nerves in the different involuntary muscles, variously modify and affix to them certain degrees of irritability which are peculiarly adapted to their respective stimuli as the blood, aliment chyle &c. which also possessing different degrees of exciting power consequently vibrate as it were with these certain degrees of irritability. The same objections ~~which~~ I made against a probability that the difference in arrangement in the muscular fibres could influence their irritability, if seated in the fibre itself, cannot be urged, against the position which I have taken with respect to the nerves, because they are dependent on an influx of nervous fluid from the brain for their sensibility and this influx may be variously modified by the circumstances which have been already premised. Whereas on the contrary, if this principle of irritability reside in the muscular fibre and

depend

on its organization alone, difference in arrangement, could not exercise the same influence on its irritability.

From all the preceding observations I infer that what has been termed irritability, and sensibility, are both properties of nerves; sensibility being a more perfect, and irritability, a much lower degree of that excitable principle with which the nerves are endowed; that the muscular fiber possesses no independent intelligent principle which prompts it to act agreeably to the force of stimuli, but it is excited to action by and through the medium of the nerves and in proportion to their degree of excitement by the application of stimuli; just in the same ratio does muscular action increase, and that they only possess the susceptibility of contraction which is acted on by the nervous influence. Thus the stimulus of the blood produces action in the heart and arteries; this action however is not ~~excited~~ by primarily operating on the muscular fiber but by first exciting

the nerves expanded on their internal surface and by that means bring into action the muscular fibres, which is varied by the quantity and stimulant quality of the blood and the excitability of the nerves of the part; hence I infer that the nerves constitute the proximate cause of all motion propagated in the system, either by some chemical action or by serving as a conductor to some subtile agent which may produce this constringing or contractile effect on the muscles; however if this nervous influence has not the direct effect of contracting them we ~~may~~ may safely and confidently conclude that the natural and healthy action of the involuntary muscles is absolutely dependent on the presence and influence of some principle of the nerves which principle, is transmitted in quantity greater or less in proportion to the excitement produced in them by the application of stimuli. And again, that the natural action of some of the involuntary muscles, the arteries for instance, depend more

on

the greater quantity of natural stimulus, for their constant and vigorous action than their superior degree of excitability; for many other parts of equal and perhaps superior excitability are quite quiescent for want of an exciting power constantly acting; thus as has been before observed where a limb has been paralyzed by the division or compression of its principal nerve, rendered nearly insensible, and the power of voluntary motion destroyed, still arterial action is feebly carried on, which is supplied by the constant operation of so great a quantity of stimulus, the blood; hence if the irritability of the voluntary muscles and arteries were precisely the same we could rationally account for the action of the one and quiescent state of the other, when we attend to the circumstance, of the latter having a quantity of stimulus operating on them, and on the contrary the former being destitute of a constantly exciting power; and hence also I infer that in fever when the muscular system is languid and

much

and much debilitated from some diminution of nervous ener-
-gy we may in like manner perceive the cause of preternatu-
rally high arterial action; viz. because a strong exciting power
is incessantly operating, and that directly on the internal pa-
-rietes of the arteries whose excitability is evidently during fever
increased either in some peculiar manner or else the blood must
acquire some additional stimulant quality, or perhaps both
may in a certain degree take place, the former I think by
a translation of nervous influence from the nerves of the
muscles to those of the arteries thereby increasing their excita-
-bility; which translation may be thus produced: It is very ob-
-vious that an exciting power or irritant when applied to a
sensible surface so as to produce increased action, therein must
necessarily be an exhaustion of excitability or the excitable
principle of that surface during the continuance of this
action, which thereby occasions a constant and speedy de-
-termination of this principle from the neighbouring or
circumjacent

parts to restore the equallibrium, in a manner similar to the rushing in of the circumambient air to a fire where in there is a vast consumption of air, and of course a tendency to a vacuum. again a plaster of flies or any other irritant when applied to a part of the body very manifestly increases the irritability, and thereby excites a more vigorous action in that part, which is effected by first rousing its irritability, and increased action necessarily ensues, the exhaustion being then in proportion to the action thus produced, the excitable principle or nervous influence of the neighbouring parts, is determined to it as a more free and ready outlet; by that means preternatural sensibility and irritability is accumulated, and from it I infer that the excitability of the arterial system is accumulated on the same principles in fever: thus it has been long established, that any cause producing fever, first occasions langor and debility which I conceive is accomplished by diminishing

Nervous

-mergy, the muscular system being subordinate is of course
-undue weak and quiescent, and consequently the exhaustion
of initability by ordinary exercise is suspended; though the
blood notwithstanding constantly acting on the arterial
system with perhaps increased force, the action and conse
-quent exhaustion thereby produced, then serves as the only
outlet to the constant though diminished flow of nervous
influence, from the brain, and the consequence of which
is, that the nervous influence of the muscular system is con
-centrated, and accumulated, in the arterial system, and
that preternatural action constituting fever naturally en
-sues. Fever thus excited, appears primarily to affect the
the arterial system, because when in any manner disorder
-ed, it is more promptly and obviously made known to the
physician, for their action is always subject to the senses and
observation; but as they are always subordinate in their
action to the state and influence of the nervous system,

must have it to its origin there, in which the primum mo
-bile of the animal oeconomy exists.

Having established I hope the rationality, that sensibility
and irritability of the animal system are only modifica
tions of the same thing, and resides in the nerves, and also
that nervous influence is, the proximate cause of all the mo
-tion propagated in the living fibres, I conceive that the
corner stone of my fabric is laid down, because they are
the principles alone, on, and through which, medicines ex
-ert their influence, and produce increased, or diminished ac
-tion in the animal system; in short the whole amounts to
this, that all medicines act on the system through the me
dium of the nerves.

It only remains for me now to consider, in what manner,
different substances taken into the stomach excite and pro
-gate, some a greater quantity of nervous energy to parti
-cular parts and others equally to the whole system.

But

But before I enter on the subject, the consideration of several operations in the animal oeconomy naturally devolves it-self on me, particularly the susceptibility of the medullary matter or nervous pulp to receive an impression from the contact of different substances and its power of communica-ting it to the brain and the whole nervous system. This is a subject dark and I fear unfathomable even to fu-ture investigations, though no difficulty in philosophy should cramp our speculations or damp the ardour to arrive at the acme, of perfection in our science; under these conside-rations I am therefore urged on to some speculations on the subject. The animal system, as in some other parts of the great fabric of nature is composed of many vari-ous parts, all of which contain many different elementary principles, and these contain fixed proportions of only a few, this may constitute the principal or only difference in most of the substances in nature, which exhibits so great a vari-

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of appearances. And notwithstanding the wonderful vari
ety observable in the texture of the animal organs we find
that the vast number of compounds are reducible by the
chemist to a few elementary substances. The medullary mat
ter of the brain and nerves, the muscles, bones, tendons, liga
ments, glands &c. though so different in texture and proper
ties are originally derived from the same source the blood;
which nevertheless is formed of so many articles of diet in
different animals and the same animals at different times,
appears, always capable of furnishing by secretion a cer
tain set of ingredients necessary for the formation of these
fixed stamina of the system; hence I am disposed to think,
that among the great variety of matter in creation there are
but few simple elementary principles composing them, and
the many compounds differ only in their proportions of these
fundamental principles. But it is a thing exceedingly mis
terious how such a variety of compounds are formed in the

system

from an apparently homogeneous mass, the blood, and equally mistrious ~~to conceive~~ to conceive how the blood it -self can be formed from such an infinite variety of substances taken into the stomach and still always ~~contain~~ contain certain component parts for the renovation of the system. To form a rational conjecture on these subjects, we are com -pelled to resort to aid from the operations of chemistry, or else give to each of the organs of the animal oeconomy a certain intelligent principle which enables it to select from the variety of component principles of the blood, those adap -ted to its nature, and texture, which would be quite vi -sionary and absurd. The former I think carries with it fewer objections, and enables us more satisfactorily to account for various phenomena of the animal oeconomy; for in the process of nutrition, I think it not an irra -tional conclusion, that chimical and corpuscular af -finities have very considerable agencies; it would indeed be

unphilosophical to imagine that animal matter was perfectly destitute of all those properties which would subject it to the laws which nature has established between different species of inorganized matter; therefore I can readily conceive that the different component parts of the system, for instance the muscles, bones, tendons, &c whose constituent parts remain immutably the same though constanly undergoing decomposition or absorption and again recomposed from the blood, may pay respect to several of the laws of inorganized matter particularly those of affinity; by which the several parts may attract and combine with those minute particles of the blood, whose nature is homogenous with them, and thereby carry on a constant renovation or nutrition in the different parts of the system. As to the reduction of the different kinds of food taken into the stomach to that state in which they are subservient to the assimilation into the blood, I conceive it is chiefly

to

to be a chemical process, for among the great variety of the articles of diet, in civilized life, nearly the whole of them may be traced primitively to a vegetable origin, and I may perhaps with safety assert, that none of them serve the purpose of nutrition in their actual state of combination; therefore we would naturally contemplate, a complete di-~~composition~~ of the substances taken into the stomach, before their conversion into chyle, and consequently when in that state, it is presumable that they are reduced only into a few compounds or simple substances, which enter in-to the mass of blood and are abstracted from it by the several parts of the system according to their different elective attractions. Thus bringing in the agency of che-mistry, we may make it serve our purpose also in accounting for that supply of nervous matter by the blood, which is essential to keep the brain and nervous system in a state susceptible of impressions by the natural and

artificial stimuli on which depend the action and health of the system. For we discover that they, as well as the other parts of the animal oeconomy are equally dependent on the blood for invigoration, especially when by any means nervous energy is impaired. Therefore considering the nerves and brain to be the primum mobile of the system, that they are the first which receive an impulse and the only parts to transmit it to the moving fibres, it is of vast importance to know their dependence on the blood, for that state essential to the conveyance of its proper influence and its consequent susceptibility of disorder through that medium; I conceive as before said of the other parts of the system that they likewise possess an inherent power of affinity for matter of a homogeneous nature, by which they select from the blood that part which serves the purpose of regenerating their loss of substance and increasing their power of conducting

nervous

influence or as I have supposed the animal electricity. We may rationally suppose that there is a certain condition of the nerves in which health consists, and when it ex-ists they only admit of such a propagation of nervous influence, to the different parts of the system as to en-able them to perform their natural and ordinary func-tions; and this condition of the nervous system, I say is no doubt dependant in part on the quality of the food taken into the stomach, as by those articles of diet which we term cordial or stimulating it is rendered much more excitable and when on the contrary we make use of a bland article of diet void of this stimulating quality for any length of time the excitement of the system is considerably reduced; when therefore any substance which we term stimulating is taken into the stomach, this stimulating principle is attracted and combines with the nerves of the internal surface of the stomach, and the

tendency to an equilibrium in the nervous system, or the power of sympathy communicates the same dis-
-position or impulse thereby produced, throughout the whole system, but more immediately to those parts with which the stomach has the most intimate and extensive nervous sympathy or communication. It is thus I ac-
-count for the impulse or impression produced on the nerves and brain and its communication to the other parts of the system producing increased excitability and sensi-
-bility. Having premised these genral principles I shall now draw the inferences deducible therefrom, and ap-
-ply them to the subject under consideration.

In the administration of medicines I conceive there to be only two genral indications and these are to stimulate or depilate; in what manner these two objects are effected, it remains for me yet to illustrate, and in doing which, I shall have frequent occasion to refer to the foregoing

principles. I will commence by again repeating, that the action or influence of medicines on the system is produced by primarily operating on the nerves and prompting them to excite action in the living fibres, and as they are distributed to every part belonging to the human body, the hair, nails, and cuticle excepted, I conceive that they are the parts alone, which are out of the ~~sphere~~ sphere of nervous influence and necessarily the immediate ope-ration of medicine; but I wish it to be understood that every individual part of the system to which nerves are distributed, does not posess the same degree of excita-bility, but as before observed it is modified agreeably to the quantity of nerves, and their exposition to the ope-ration of their appropriate stimuli which is varied by the texture of the part through which nerves pass: for instance, the heart and arteries, the muscles, the sto-mach and intestines, the lacteals and lymphatics, the

bones &c. possess different degrees of nervous influence ac
-cording to the above circumstances, what very much corro
-borates, and indeed reduces to actual certainty the po
-sition which I have before taken, that is, that the tex
-ture of a part gives to it, its degree of irritability, is,
the well known fact that the bones and tendons though
not possessing the smallest degree of sensibility in their
sound state are rendered acutely sensible, by an al
-teration of their texture by inflammation. Receiving
this as correct then, we may readily account for the
sensible difference in the operation of many medicines
on the several parts of the system, though before un
-dertaking this, I will first inquire into the method by
which medicines are brought into actual contact with
the nerves so as to produce their effect. It appears evident
to me that all medicines taken into the stomach with
a view to a genral or local operation, produce excitement

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the whole or a part of the system either by acting immediately on the nerves of the stomach, or other surfaces to which they are applied, and through them on the brain and whole nervous system, or else they act through the medium of the blood, on the excitability of the different parts according to their force. With medicines as it is with most of the articles of diet they almost invariably, suffer decomposition by the process of digestion, and it is presumable that very few act when in their state of combination, but only furnish after decomposition some principle which excites the nerves to exercise their influence. Seeing then that medicines come in contact with, and act on the nerves only through the channels just mentioned, we can without difficulty trace them in their operation on the system both when they act generally and also when they are said to act locally; thus, we are well aware that the stomach and intestines, blood vessels, absorbents &c.

all

posess certain degrees of excitability, sui generis, and also, that each of them has certain appropriate stimuli destined to them, which produce their ordinary action by operating on their excitable principle; it is evident then that when the brain and nervous system are excited by the operation of medicines through the medium of the nerves of the stomach, all the different parts of the system share a part in this excitement in proportion to their usual quantity of nervous influence, that is, the excitability or susceptibility of action in the different parts is more or less according to the degree of nervous influence commonly received by them; therefore to estimate the degree of preternatural action thus produced in different parts we should consider the probable force of their natural stimuli together with their increased excitability: for example we might say the ordinary stimulus of the blood to be 10 the ordinary excitability of

of the bloodvessels to be 5 these two numbers multiplied we will say indicates the force of natural action which is 50, but if there be an increase of 6 degrees of excitability, this would produce an action many degrees higher than health; (that is 100) thus by comparing the degrees of excitability supposed to be natural to each part also their appropriate stimuli we may readily account for the greater action produced in some than other parts by medicines exciting the nerves and thereby imparting an increase of excitability, which, I have considered as a property belonging to them. On the contrary when a stimulus acts on the system through the medium of the blood it must necessarily be taken into every part to which the blood is distributed, but its operation is evident only in particular parts unless its power be very great, for the different parts belonging to the system, being possessed of very different degrees of excitability if a double stimulus is taken in, it might be

less than the natural stimulus of some parts, and great-er than others, and consequently its operation sensible only in those parts whose ordinary stimuli were inferior to it; to illustrate this we will say that the ordinary or natu-ral stimulus of the intestines is 5, bloodvessels 10 and lym-phatics 7, well, if a medicine is taken into the mass of blood which is distributed to each of those parts, its stimu-lant power being 6, it is very evident that it would pro-duce no sensible effect on the bloodvessels or lympha-tics, being inferior, but being superior in power to the na-tural stimulus of the intestines, it would produce pre-ternatural excitement therein, and hence those medi-cines which act in this manner have been termed lo cal stimulants as the classes of purgatives, diuretics, &c. From this I conclude that those medicines which act as general stimulants must surpass in power, the natural stimuli of all the different parts of the system; for

for supposing the natural stimulus of the blood to be the greatest of any the individual systems, if a stimulus exceeds it in power the whole will be necessarily effected. As all the parts belonging to the system capable of motion are supplied with fluids which derive their origin from the blood, of course they are all manifestly subject to the operation of medicines with which the blood is impregnated if, agreeably to the preceding observations the stimulant power of medicines is greater than the fluids with which they are constantly supplied, for instance if a part has been long habituated to a certain stimulus its removal and the application of one of inferior power would diminish instead of increase the action of the part, and although it might act as a stimulant to some other parts, yet it might to that part be considered a sedative.

By these observations I do not wish to imply that the operation of all medicines which act locally, is effected through the medium of

the blood, but that in many instances they do operate in different parts in this way; for it appears very probable that every individual part whose texture and property is different, receives certain appropriate parts of the blood, for its nutrition, which keeps up certain specific actions in them; it is very obvious then that if the blood were impregnated with any stimulant it would vibrate as it were with the irritability of some one of the parts to which it is distributed and excite preternatural action therein; it is thus I account for the local action of some medicine when taken into the circulation as those which we term diuretics, emmenagogues &c. I am acquainted with no physiological principles which can justify an opinion, that certain substances taken into the circulation can be determined to any particular part of the system, and entirely excluded from every other, but consider that whatever is taken into the circulation of the blood, is

distributed

to all parts of the system in proportion to the quantity of blood they receive. In this manner likewise, I can imagine that the action of the different secretory or -gans may be considerably influenced, for it is quite ra tional to suppose that every gland in the system whose function it is to secrete a peculiar fluid, must neces -sarily have a peculiar structure, which gives to its nerves a degree of initability sui generis, and consequently, that specific action is propagated to its bloodvessels which is alone capable of separating from the blood its parti -cular secretion; thus for example, we may say the liver has a structure different from all the other glands of the body, and of course gives to the nerves of that part a certain degree of initability, which is alone capable of producing that specific action, essential to the separa -tion of the bile; the same supposition will equally ap -ply to all the secretory glands of the system, for it would be

very irrational to suppose that the blood is not precisely the same throughout the arterial system, and contains the component principles of the bile in the liver and destitute of them in all the other parts of the body; or equally irrational to suppose that secretion is a mechanical process, and that the difference in structure in different glands enables them to filtrate from the blood their particular secretion. Again we perceive that the process of secretion is not confined to a glandular structure, but that it may be carried on in any of the soft parts of the body, by exciting a certain degree of inflammation, as it is well established that pus is a secretion produced by inflammation, which fact serves to corroborate the above belief, that a specific action is necessary for the production of every different secretion, and that this action depends on the peculiar irritability of the parts; and like the other parts of the system the action of the glands may be preternaturally increased by

certain stimuli which vibrate with their different degrees of initability.

I will now conclude with only a few remarks on the operation of the principal classes of medicines, and as the sensible operation of all is effected by exciting a more vigorous nervous influence, either generally, or locally, we may with propriety term every medicine which produces a sensible effect on any part of the system, a stimulant, according to the following definition of that term. By stimulants I understand those medicines, which when taken into the system, excite increased energy in some part or in the whole of the nervous system and brain, and consequently an inordinate or increased action in the moving fibres of some part or the whole of the system. But, as medicines possess very different degrees of stimulating power, a subdivision into different classes according to their relative operations, has always been deemed necessary, by the

the different writers on the subject of the materia medi
-ca. I shall commence with remarks on the operation
of that class of general stimulants which is greatest in
power and then in a very cursory manner, proceed to
a few observations on one or two others whose actions are
both general and local, by which my ideas in the
preceding part may be more clearly illustrated.
The class termed stimulantia or the diffusible stimulants,
which is the most powerful, speedy and transient in their
operations in the human system, and to which, opium,
ether, camphor &c. belong, may I think properly compre
-hend the two classes termed by Mr. Murray narcotics
and antispasmodics, because the narcotic and antispas
-modic effects are only accompanying symptoms of the pow
-erful action of the diffusible stimulants, and each of the
articles arranged under these classes, produce more or less of
these general effects, according to their greater or less power.

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All the medicines therefore which I should include under the general class of diffusible stimulants, I conceive to act in a similar manner and only differ in degree of power, that is, they act primarily on the nerves of the stomach, and the effect is communicated to the brain and thence propagated throughout the whole system; and every part subject to nervous influence shares a part in the effects of these medicines, in proportion to the degree of excitability belonging to the several parts, which is varied by circumstances before observed. The manner in which an impulse is given to the nervous system by different substances taken into the stomach, has been suggested in a preceding part, and I can form an idea, of no other more rational though visionary; that is to say, the nervous pulp possess some chemical affinity for certain principles belonging to different substances, with which when it is combined, it serves as a better

conductor

to that nervous fluid which excites the muscular fibre to motion. That this stimulating matter, which thus affects the nerves is identically the same in every substance which we term stimulants, I contend is not the case, because a medicine of only moderately stimulating power (a tonic for instance) cannot be given in a dose sufficiently great to produce the same effect which is occasioned by a diffusible stimulant given in only a small quantity, and I suspect one certain matter could not be so diluted by different substances as to produce such a variety of effects, but that in the different stimulants, there are contained, certain peculiar principles for which the nerves have an affinity, and which produce effects very similar but only different in degree; and in like manner do the whole of those which we have termed diffusible stimulants possess certain degrees of power, for we cannot produce precisely the same effect from the administration of any two of

of them, regulate the dose in what manner we please, but their degrees of power approach so near each other that we may very well arrange them under one general class. The effects of these medicines extend generally throughout the system and is so speedy that we may suppose an immediate combination to take place between them and the nerves of the stomach, and these propagate it to the brain and rest of the system; there appears to be a point of saturation between every stimulant and the nerves, that is, after receiving a certain quantity no farther combination is effected and at which its maximum effects are produced; but in the mean time the action or combination of one of superior power is not prevented, for after the system has received all the energy which one stimulus can afford still it is susceptible of very considerable effects from one of superior power. Many of the diffusible stimulants apparently have a directly sedative effect when administered

in large doses, which is occasioned by the very quick satura-
-tion of the nerves with that principle which promotes
the propagation of nervous influence, and produces evi-
-dent excitement until it arrives at that point of satu-
ration by which this communication of nervous influence
is retarded, and consequently the powers of the system thereby
much destroyed, producing what has been termed indirect
debility. Thus, opium taken in a moderate dose gives
energy to every function of the body, and mind, but if
given in a large dose, the action of the whole system is di-
-minished in so short a time that there appears to be no
previous excitement, because the nerves and brain have re-
-ceived this stimulating matter to the point of saturation,
which in a great measure destroys nervous influence and
brings on indirect debility, and all the peculiar symptoms
dependent thereon. The point of saturation with the
different medicines of this class is not the same, but they occasion

diminished action and the many peculiar symptoms which result therefrom, more or less according to their greater or less affinity and combination with the nerves. These are the general principles on which they act, and as to the peculiar symptoms accompanying the operation of each of the medicines belonging to this class, I shall pass over them as inexplicable.

The class of tonics next in consideration which also act generally on the system, is far inferior in point of stimulating power to the former class though they are more slow and permanent in their operation. The operation of this class of medicines is I conceive effected in a manner similar to the former, that is, principally on the nerves of the stomach and through that medium saturating the nervous system with their stimulating principle; nevertheless I am inclined to the belief, that the blood may also be impregnated with the same principle, but this notwithstanding would not

increase

their effects on the system, for the nerves being saturated with the stimulating substance, the application of the same through the blood would effect no farther combination. The stimulating power of the principal article belonging to this class, surpassing the greatest natural stimulant of any the individual parts of the system, their effects must necessarily extend to all, in proportion to the nervous communication of the sexual parts; and as their operation is slow, and they do not suddenly elevate the excitement of the system far above the healthy standard, of course the fall from that state of excitement is slow and almost imperceptible; not like the strong diffusible stimulants, do they, almost instantaneously elevate the system many degrees above par and give room for a sudden and very perceptible fall.

I come now to consider the operation of one of those classes

of medicines whose action is local, the class of purgatives for instance, which may suffice for the rest. The sensible operation of this class of medicines is confined principally to the intestinal canal, though I do not suppose that they are determined alone to that part, but that some of them, particularly some of the drastic purgatives, are taken into the circulation and conveyed to every other part by the blood; though being inferior in force to the natural stimulants of many parts, their effects are only visible in such as are supplied with a more feeble natural stimulus; for instance, being superior to that part of the blood which the intestines constantly receive, and sometimes also to other parts, (as the kidneys) whose degree of irritability is nearly the same with the intestines, they excite preternatural action therein, and consequently quicken or increase the action of those parts producing purging, diuresis, &c. Almost every medicine

which

is taken into the stomach and exerts an action on any part of the system, is I believe in part received into the circulation, and as it is probable they are all decomposed before entering into the circulation we should not expect to detect them in the blood in their state of combination: hence I conclude that the presence of a medicine in the blood in an undecomposed state, should not be the only criterion by which we are to judge whether or not it enters into the circulating mass, because its active principle may be received in a separate state. It is not my opinion that purgatives produce their effects by only acting as an irritant to the inner surface of the intestines, but some of them enter into the circulating mass and increase the irritability of the intestines, through that medium, thereby rendering the susceptibility of action by the excrementitious matter much greater; and as purging

frequently depends on an increased peristaltic motion of the intestines, we may rationally suppose that these medicines operate through the same medium in which the natural stimulus does, which excites this action; and I conceive that the muscular fibres of the intestines are prompted to act not alone by excrementitious matter carried through them, but by some part of the blood, serving for their nourishment and natural stimulus, constantly received, which excites the nerves and through them produces action in the muscular fibres; it is obvious then that the active matter of the purgatives may be blended and conveyed along with the natural stimulus of the intestines and thereby increase their peristaltic motion to that point which produces purging. I will conclude this subject by observing that a certain specific action in the intestines is necessary to induce purging, hence we may very readily explain why a certain free of stimulus is required

such

such as that exerted by those medicines which we term purgatives, and why those superior in power fail to produce that effect.

The influence of habit on the animal system is a fact so well established, that it would be unnecessary for me to endeavour to furnish one corroborating argument in its favour, but I will only observe that the difference in the predispositions of different people, occasioned by climate, occupation, and diet, renders the operation of medicines so variable that we can affix to them no uniform effect in different people, nor the same person at different times, but they generally tend to produce similar effects which are varied only in degree.

I might go on and expatiate to considerable length on the operation of each individual class of medicines by applying the general principles which I have

advanced

advanced, to each of them, but as my time is narrowly limited and I may be readily anticipated on the operation of the other local stimulants, I will conclude with a request to the faculty to excuse the free range which I have given to my imagination, and also that ~~accurate~~ want of connection, exhibited in this composition, which is always the offspring of great haste.